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The Des Moines Diphtheria Epidemic of 1912-13

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THE DES MOINES DIPHTHERIA EPIDEMIC OF 1912-13.

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The diphtheria epidemic which this investigation covers began September, 1912, and closed April 19, 1913. Its beginning was coincident with the closing of the annual State Fair and the opening of the public schools. Its appearance was almost simultaneous all over the city, new cases appearing in remote sections and then cropping out again in the infected districts. Its center was very plainly in the so-called down town district, inhabited by the poorer classes of people. Yet it was no respecter of persons; rich and poor, learned and ignorant alike, suffered its dread ravages. Nor was it confined to youth alone; it seized upon whomever it could make prey.

This epidemic presented many different angles for investigations. We were constantly tempted to follow divers paths, many of them remote from the purpose of this investigation.

We shall confine ourselves principally to a plain statement of facts, as nearly as we could discover them. We shall not make any claim to accuracy in any of our data or conclusions, for reasons obvious to all who have endeavored to make similar reports. Absolutely accurate data and accurate conclusions therefrom were impossible. The data from which we constructed our charts are not correct, which fact we repeatedly discovered, much to our dismay. These data we secured at the city physician's office, where they had not been properly reported as the law provides.

We do not vouch for our report of the total number of cases, total number of deaths, or for the accuracy of our statement of conditions or conclusions drawn. We are convinced that the total count of diphtheria cases is too low, for we learned of cases which were not reported. At many places where two or more cases occurred in the same house only the first case was reported; and in other places, it is our opinion, there were cases which were not reported at all. This would lead to the conclusion that the death ratio is too large. Of this we are uncertain, for, especially at the beginning of the epidemic, some deaths occurred which were reported as caused by other diseases, and subsequent to the burial of the deceased clearly defined cases of diphtheria appeared among other members of the family. In one case which we found which occurred at the beginning of the epidemic, the child died only a

few hours after the doctor was called. He treated the child for another disease, and doubtless reported the death as caused by that disease. Very soon after, another child in the family showed similar symptoms, although more marked. The same doctor was called again. He at once diagnosed the case as diphtheria, administered antitoxin, and the child quickly recovered.

From these facts we can draw no conclusion at all as to the degree of correctness of the death ratio. For, while on the one hand, not all the cases were reported; on the other hand, we are convinced some deaths occurred which were credited to other diseases. We shall assume, therefore, that the death ratio is approximately correct and shall present our figures on that assumption.

The investigation of the diphtheria cases among school children was most interesting. Chart No. I shows the total number of cases per month in each one of the schools of the city where children were removed because of diphtheria. In this it is seen that Irving school leads by an alarmingly large margin. This is in the center of the so-called down town section and is the poorer section of the city. Many of the houses and flats are dingy and dilapidated. Many of the back yards are littered with rubbish, the doors of some of the houses were poorly screened, and the interior of many of the homes visited bore striking evidence of a conservation of domestic labor. This section is the

CHART I.—DIPHTHERIA CASES PER MONTH IN THE DES MOINES SCHOOLS.

School	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	Apr.	Total
Benton		2				1		1	4
		1*							1*
Bird		1	1						2
Bremer	1		1	1	1	2			6
Brooks		4							4
Bryant	2			1		2			5
Cary				1					1
C. C. C. College						1			1
Casady			1			1			2
		1*							1*
Cattell		2	2						4
Clarkson			1			1			2
Crocker	1			4		2			7
Curtis		2	3	1					6
	1*								1*
Des Moines College	4			2					6
High School, East Des Moines		2							2
High School, North Des Moines			1						1
High School, West Des Moines		1		1			1		3

CHART I.—DIPHTHERIA CASES PER MONTH IN THE DES MOINES SCHOOLS.—CONTINUED.

School	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	Apr.	Total	
Drake University		1				1			2	
Elmwood					2	1		1	4	
						1*			1*	
Franklin	3	3	1		1	1			9	
				1*					1*	
Garfield	2		1	3					6	
Given				1					1	
Grant	1			1			2		4	
Grant Kindergarten			1						1	
Greenwood		1	1	3	2				7	
Highland Park College			1	3		2	1		7	
Howe						2			2	
Hubbell				1	2	2			5	
	5*	2*	1*						8*	13%
Irving	25	23	6	4	1	1	1		61	
Jefferson					1				1	
Kirkwood	1			1	1	2			5	
Lincoln	2	1		2	1		1		7	
Logan	2		1						3	
Longfellow		2	2						4	
McHenry		3							3	
McKinley		1	1						2	
Nash			1						1	
Oak Park			2						2	
Park Avenue			2	2	1	2			7	
Phillips			1			1			2	
Sabin		1						1	2	
Scott		2							2	
St. Ambrose	3	1		1					5	
St. Johns						1			1	
					1*				1*	
Visitation			1		2	3			6	
					2*				2*	
Wallace	1		2		2				5	
Washington				1					1	
Webster				2	1				3	
					1*				1*	
Whittier					1	1			2	
Willard	2		1						3	
	6*	4*	1*	1*	4*	1*			17*	
	50	53	34	36	19	30	6	2	230	
Diphtheria Ratio	12%	7.5%	2.9%	2.8%	21%	3.3%			7.3%	

Note: Numbers followed by stars indicate number of deaths.

The number of cases per school is subject to the following correction: The data from which we constructed this chart we obtained in the City Physician's office. On some of the cards filed there, two or three schools were named, indicating that two or three schools were represented by the home quarantined. In this chart we have given credit only to the first school mentioned in the report. This may or may not be correct.

rendezvous of at least fifty-seven varieties of cats and their canine enemies. To effect an absolute quarantine under such conditions was quite impossible. First, because the people were not in sympathy with the quarantine laws, and not only concealed the cases until they themselves became alarmed, probably infecting many others before reporting the disease; but, second, they were lax in observing the quarantine after it was placed upon the house and allowed cats and dogs to run hither and thither with little restriction.

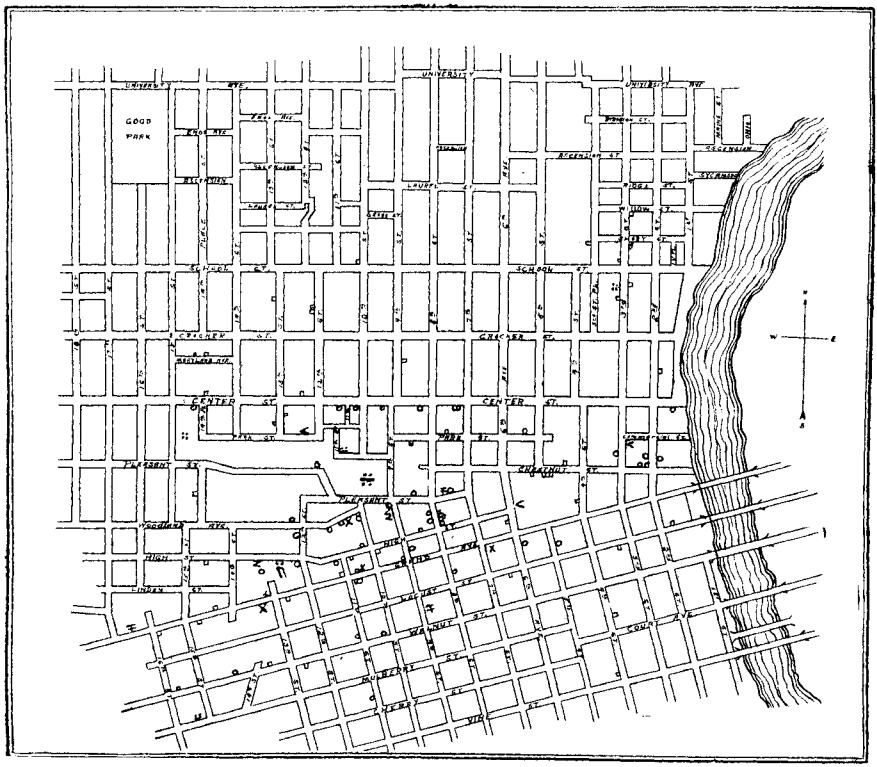

Chart II.

FIG. 1. Diphtheria cases in Irving school district.

The chief play ground of the children of this section is the street, alleys and back yards. Consequently, the gang spirit is pretty well developed. In this way a child who has become infected, though hardly aware of it yet, beyond a slight soreness in his throat, could infect a whole group of children. This is probably what happened, for not only did the epidemic spread by leaps and bounds among the Irving school children, but other children got it who lived in this section but

who attended other schools, viz.: McHenry, Howe, Lincoln, St. Ambrose, Longfellow, Crocker, Garfield, Green, Cooper, Franklin, Highland Park College and West Des Moines High School. It will be observed that the number of cases in these schools is slightly above the average. By such means of dispersion the epidemic spread all over the city.

It may be noticed on the chart that the epidemic was well under control in Irving school by November. A nurse was employed for the Irving school and close supervision was made of the scholars. Another fact of much importance was that many of the parents withdrew their children from school at the beginning of the epidemic, but allowed them to play in the streets with other children. After confidence in the nurse became established, the children were returned to school, hence withdrawn from the streets, kept under stricter supervision and a very marked decrease in new cases resulted.

Chart II locates all the diphtheria cases in the Irving school district. Symbol ◯ locates cases of diphtheria of Irving school children; symbol □ locates cases of diphtheria of all others not in Irving school. Symbols × and ∓ indicate that there were two cases in one house. Symbols < and :: locate cases that resulted in death. The figure ÷ represents Irving school. It will be noticed that a circle, with Irving school as the center, and a five block radius, will include most of the cases in this district. This circle also will include the dingiest of the houses in this district.

In this district approximately one hundred and forty-two (142) cases were reported. Of this number sixty-one (61) were in Irving school. This leaves eighty-one (81) who were not in Irving school. Of this number seven (7), or 8.7 per cent, proved fatal. It will be noticed, then, that fifteen (15) of the one hundred and forty-two cases in Irving school district proved fatal, or one out of every ten resulted in death. This is an alarmingly large ratio.

The total number of cases in the city reported during the period of our investigation (September 1st, 1912, to April 19, 1913) was three hundred and twenty-four (324), with twenty-seven (27) deaths. The death ratio for the entire city was 8.3 per cent. There were, then, one hundred and eighty-two cases not in Irving school district and twelve (12) deaths, making the death ratio 6.5 per cent. The following table shows these facts more concretely:

	Cases	Deaths	Per Cent
The City	324	27	8.3
The City not including Irving School District	182	12	6.5
Irving School District	142	15	10.0
Irving School District, not including Irving School	81	7	8.7
Irving School	61	8	13.0

It will be noticed that Irving school contributed nearly one-sixth of the city's total, that nearly one-third of the total of deaths were in the Irving school. It will be noticed further that Irving school district contributed nearly one-half of the city's total cases, and over half its deaths.

Chart III illustrates these figures by three curves, a, b, c. Curve (a) represents Irving school; curve (b), Irving school district; and curve (c), the city. Here it will be noticed what impetus Irving school district gave the city's curve and then the persistence of the epidemic throughout the city after it was practically under control within the Irving school and Irving school district.

Chart IV illustrates the comparative relation of the epidemic in Irving school district and in the city. Curve (a) represents Irving school district and continues till a total count of one hundred and forty-two is reached, when the investigation closed on April 19, 1913. Curve (b) represents the development of the epidemic in the city and continues till a count of three hundred and twenty-four is made. Here it will be seen that the epidemic's principal increase during September and October was in the Irving school district. Below is shown by figures the relation of the epidemic in Irving school district and in the city:

NEW CASES.

	City	Irving School District	Irving School
September	44	32	25
October	76	46	23
November	56	19	6
December	45	18	4
January	44	15	1
February	39	6	1
March	15	6	1
April	5	0	0
	324	142	61

This shows very concretely the very direct relation of the city's epidemic development to the Irving school district.

Chart V shows graphically the number of cases in the city per month from May 1, 1912, to April 19, 1913. Here will be seen just an occasional case during the spring and summer, and only one death, that occurring in June. The following table shows this by figures:

	Cases	Deaths	Ratio, Per Cent
May	7	0	0
June	23	1	4.3
July	3	0	0
August	0	0	0
September	44	6	13.6
October	76	7	9.3
November	56	2	3.5
December	45	2	4.3
January (1913)	44	4	9.0
February	39	5	12.8
March	15	0	0
April 19	5	1	20.0
	357	28	7.8

It will be observed that there were no new cases reported in August, 1912, and in September forty-four (44) cases were reported, followed by seventy-six (76) more in October. What, then, was the cause of this sudden epidemic? It will be noticed on Chart III that the first case appeared on September 8th, and was in the Irving school district. This was right at the close of the annual State Fair. Houses all over the city were opened and beds were let to out of town visitors, numbering several thousands, from all over the state. Houses in the down town district were especially in demand by those seeking accommodations, because they were more in the center of the city. This would lead to the suggestion that the disease was either brought in by the visitors, or that the bacteria were stirred up in some of the formerly quarantined houses through the effort to provide accommodations for as many guests as possible. Whichever might have been the case, the disease could quite readily have been carried hither and thither by the transient crowd. But why, then, should it start in the Irving district and gain such headway before it made its appearance in other parts of the city, since homes all over the city were opened to guests? The houses in other parts of the city, as a rule, are better kept and by habit better sanitary rules are observed, and the environment was less favorable to these bacteria should they have appeared there. It might, then, be asked,

why did the disease persist in other sections of the city after it was practically under control in the Irving school district? It will be remembered that extra vigilance was maintained in the Irving school district and the disease soon brought under control. Further, it is possible for one individual who has the virulent diphtheria bacteria in his throat in large numbers to be by nature so immune to their action that for days he might be quite unaware that he has the disease. In this way he could spread the disease broadcast unwittingly. We found several cases where this did actually occur. Two apparently healthy children may play together. One is stricken with the disease. The other child seeks a new play mate. Soon the third child is stricken, and then, soon after, the second child has a very mild attack, in fact, scarcely being sick at all. In such a case the second child caught the disease from the first and passed it on to the third before he himself was taken ill. Such incidents were multiplied many times over. One incident which came to our notice was the case of a man placed under quarantine. He was scarcely ill at all, but after the twenty-first day negative cultures were obtained. The next day positives were obtained. The third day negatives were again obtained, followed by positives on the fourth day. These alternated for five weeks more, keeping the man under quarantine for over two months. How many more, then, may there have been, who unknowingly had the disease, were only slightly affected by it, were not quarantined, and who spread it broadcast among their associates, at home, in social gatherings and on the street? Can we wonder, then, that the problem in this city was so difficult?

The death ratio was alarmingly large during this epidemic. Why? Perhaps the organisms were unusually virulent. It will be observed that the largest death ratio was in the Irving school district. Here, it was found, there was greater tendency to hesitate in calling the doctor, and, when he was called, to oppose his wishes and commands. Some would not permit the antitoxin to be administered unless as a last resort, and quite frequently the delay cost the life of the patient. In many places the patient was not properly cared for, due to ignorance and opposition to the commands of the physician.

There was considerable complaint of partial paralysis after recovering from the disease, poor vision, speech impediments, deafness, stiffness of the joints and uncertainty in the use of the limbs. Many blamed this to the heavy doses of the antitoxin, which, in nearly every case, had been delayed, and then a very large dose given to save the life of the patient. On being questioned on this point, however, nearly all would admit that had the antitoxin not been administered the patient would

probably have died, so they accepted without demur this temporary paralysis. We heard of one patient who went to an osteopath, who aided much in hastening control of the limbs. We are inclined to believe, on reading results of investigations, that the after effects noticed were due more to the toxic effects of the bacilla diphtheria than to the antitoxin administered.

Following the period which closed our investigation only a very few new cases appeared. Constant vigilance was maintained and in a very few weeks the epidemic was completely conquered.

The author takes pleasure here to acknowledge the valuable assistance given him by Elizabeth Mae Gittins, who helped to procure and arrange data, and by Dr. H. L. Sayler, City Physician, who turned over to us all his records.

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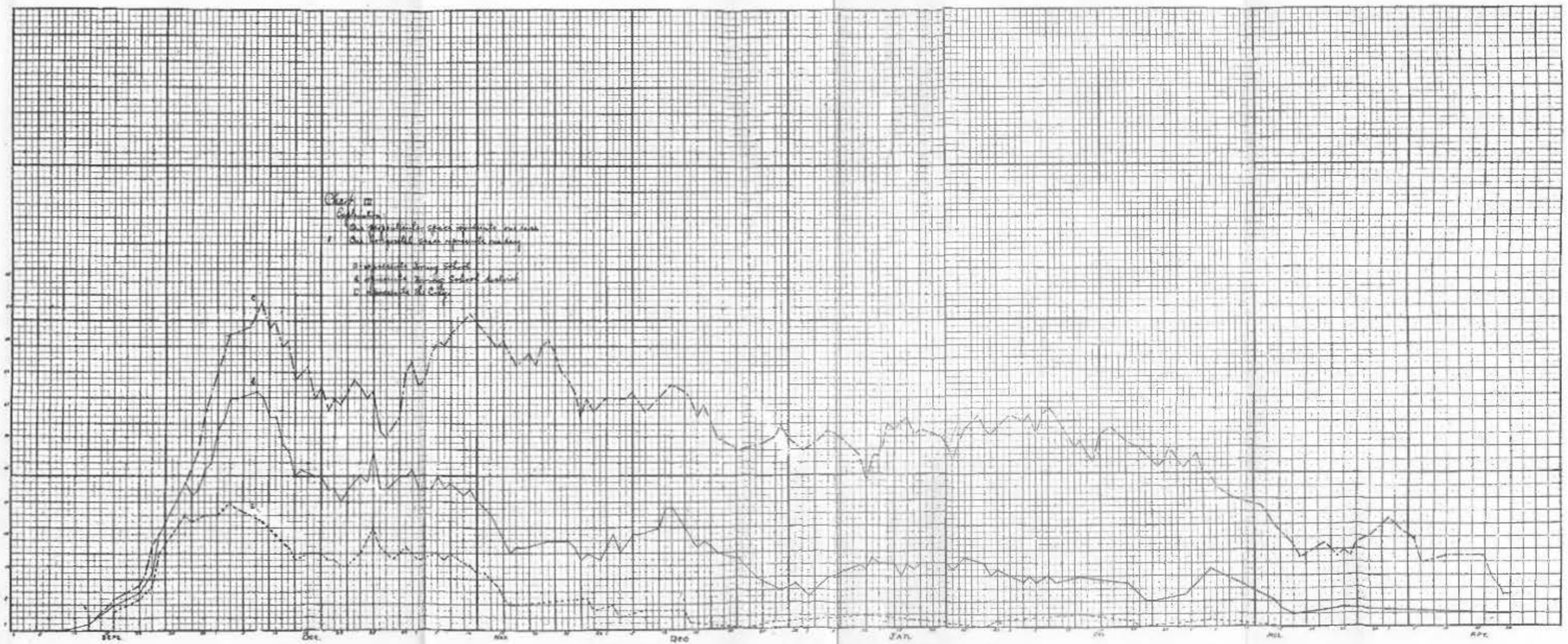

PLATE II. Diphtheria cases in Irving school, Irving school district and the city.

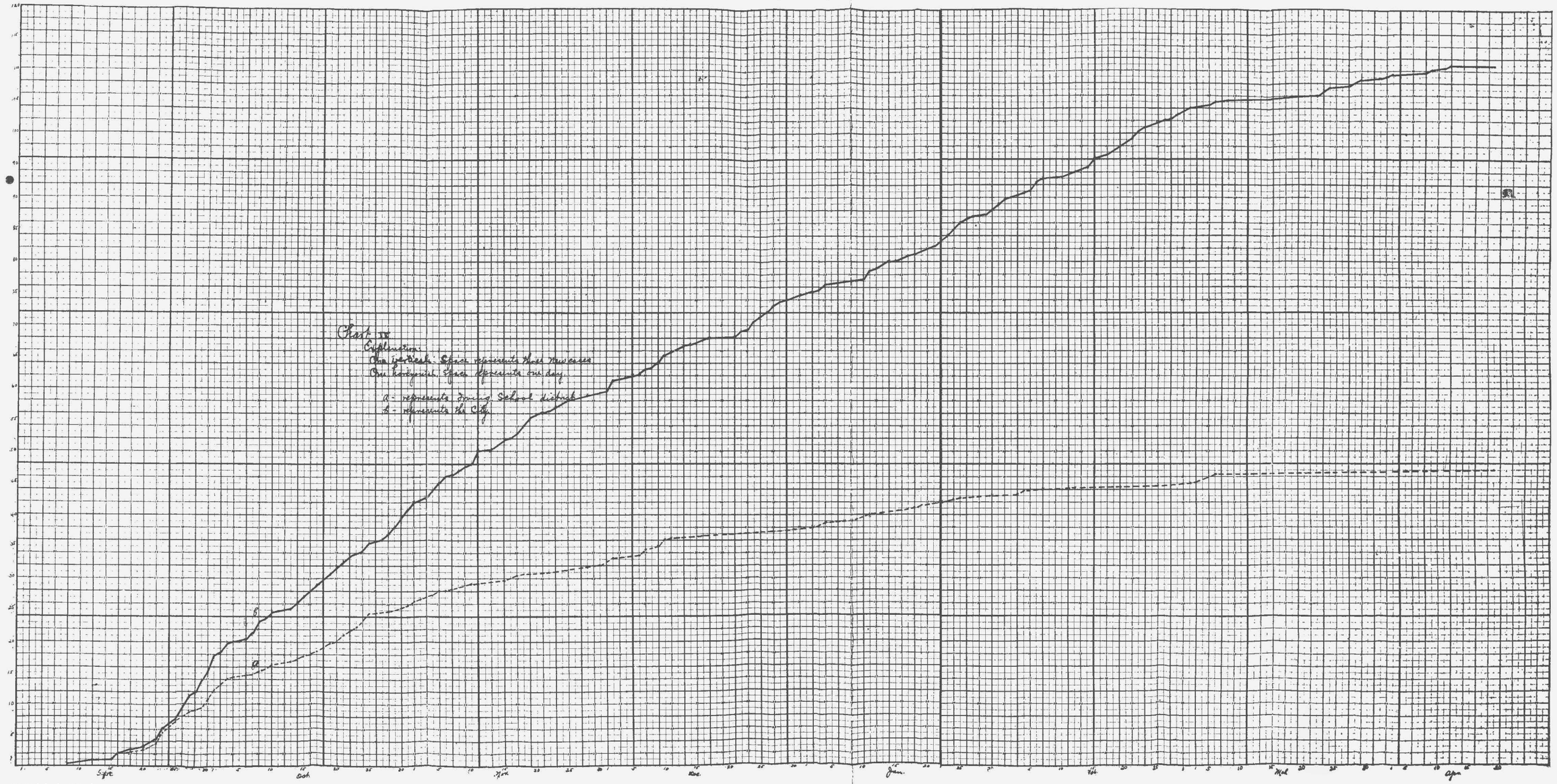

PLATE III. Comparison of diphtheria epidemic in Irving school district and in the city.

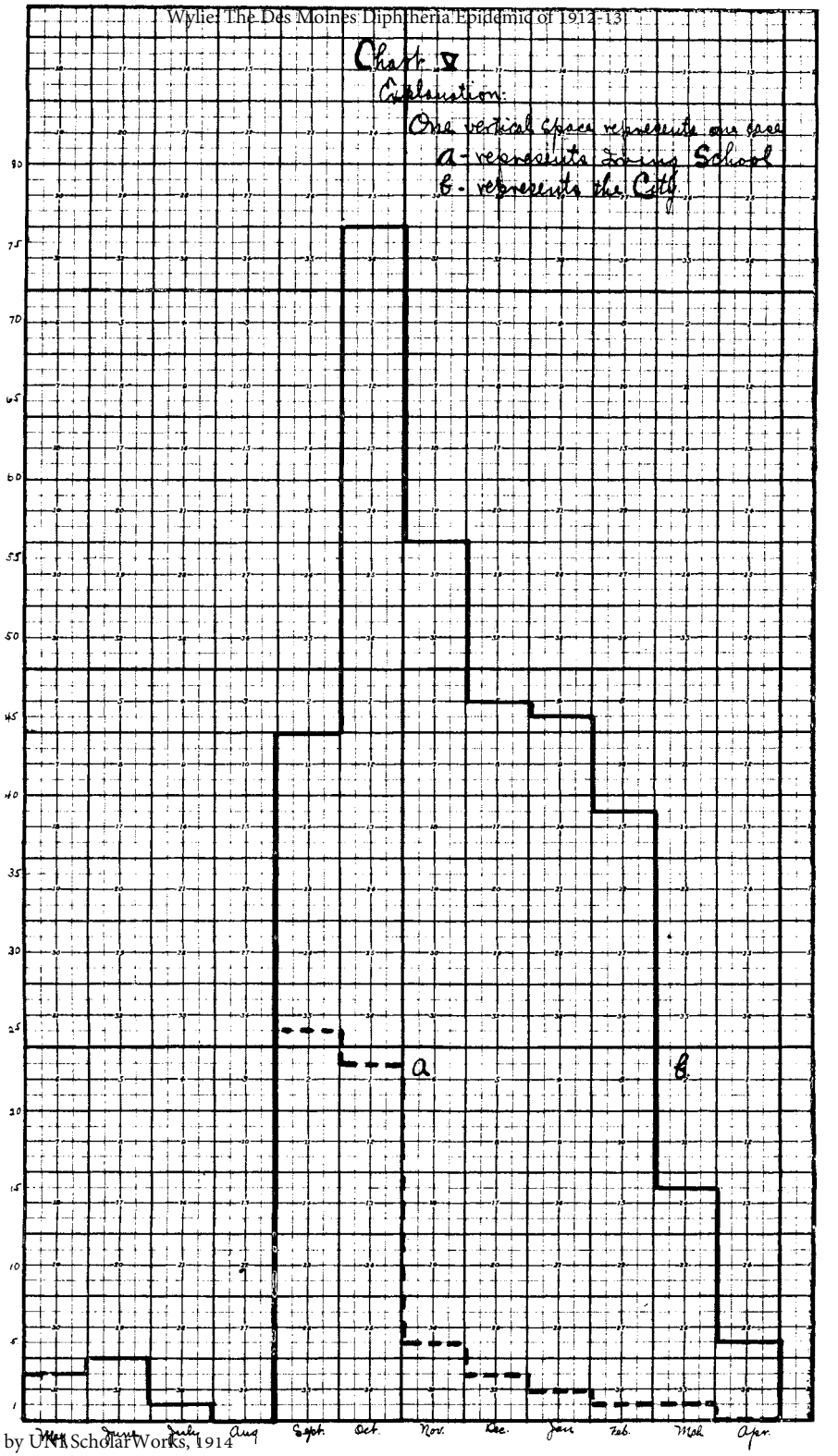

PLATE IV. Number of cases of diphtheria in the city.